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Ralph A. Dowell of DOWELL & DOWELL P.C.
2111 Eisenhower Ave.
Suite 406
Alexandria, VA 22314

EXAMINER	
SHECHTMAN, SEAN P	
ART UNIT	**PAPER NUMBER**
2125	

DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/697,552	TOYSERKANI ET AL.	
	Examiner	Art Unit	
	Sean P. Shechtman	2125	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 October 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/19/04; 5/14/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

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DETAILED ACTION

1. Claims 1-36 are presented for examination.

Information Disclosure Statement

2. The information disclosure statement filed May 14th 2004 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Fig. 1, element 10. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 1 recites the limitation "the growing clad" in lines 16-17. Claim 3 recites the limitation "the first input signals" in lines 3-4. Claim 3 recites the limitation "said rules" in line 8. Claim 3 recites the limitation "the outputs" in line 9. Claim 7 recites the limitation "the solid/liquid interface" in lines 8-9. Claim 7 recites the limitation "the melted surface" in line 9. Claim 8 recites the limitation "the pattern recognition software" in line 13. Claim 8 recites the limitation "the melt pool" in line 17. Claim 15 recites the limitation "the clad" in line 5. Claim 18 recites the limitation "the reference plane" in line 4. Claim 20 recites the limitation "the height" in line 19. Claim 20 recites the limitation "the melted surface" in line 20. Claim 21 recites the limitation "the width of the clad" in line 1. Claim 32 recites the limitation "the heated area" in line 3. Claim 33 recites the limitation "the preferred real time values" in line 18. There is insufficient antecedent basis for these limitations in the claims.

5. The term "substantially" in claims 8 and 31 is a relative term which renders the claims indefinite. The term "substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The suppression of fluctuations in height has been rendered indefinite by the use of the term substantially. The term "substantially" is often used in conjuncture with another term to describe a particular characteristic of the claimed invention. It is a broad term. In re Nehrenberg, 280 F 2d 161, 126 USPQ 383 (CCPA 1960). The court held that the limitation "to substantially increase the efficiency of the

compound as a copper extractant" was definite in view of the general guidelines contained in the specification and the rest of the claim. In re Mattison 509 F .2d 563, 184 USPQ 484 (CCPA 1975). In the instant application, the examiner respectfully submits that the application is silent as to any general guidelines contained in the specification and the rest of the claim.

6. The term "substantially" in claims 15 and 33 is a relative term which renders the claims indefinite. The term "substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The giving of the preferred real time values or the desired real time values been rendered indefinite by the use of the term substantially. The term "substantially" is often used in conjuncture with another term to describe a particular characteristic of the claimed invention. It is a broad term. In re Nehrenberg, 280 F 2d 161, 126 USPQ 383 (CCPA 1960). The court held that the limitation "to substantially increase the efficiency of the compound as a copper extractant" was definite in view of the general guidelines contained in the specification and the rest of the claim. In re Mattison 509 F .2d 563, 184 USPQ 484 (CCPA 1975). In the instant application, the examiner respectfully submits that the application is silent as to any general guidelines contained in the specification and the rest of the claim.

7. Referring to claim 19, depends on claim 19. For purposes of examination, it will be assumed that claim 19 depends on claim 18, and claim 18 depends on claim 17.

8. Due to the number of 35 USC § 112 rejections, the examiner has provided a number of examples of the claim deficiencies in the above rejections, however, the list of rejections may not be all inclusive. Applicant should refer to these rejections as examples of deficiencies and

should make all the necessary corrections to eliminate the 35 USC § 112 problems and place the claims in proper format. Due to the vagueness and a lack of clear definition of the terminology and phrases used in the specification and claims, the claims have been treated on their merits as best understood by the examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 1, 2, 5, 6, 9-12, 15, 30 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 6,122,564 to Koch (supplied by applicant).

Referring to claims 1 and 15, Koch teaches a system for producing a cladding on a substrate, comprising:

a) a laser for processing materials and focusing means for directing and focusing a laser light beam from said laser onto a substrate surface (Fig. 1, elements 110 and 112), a substrate holder and positioning means for adjusting the position of the laser light beam and the substrate with respect to each other (Col. 4, lines 8-16; Fig. 1, element 114), and powder injection means for injecting powder onto said substrate (Figs. 2 and 3, element 202; Col. 4, lines 23-47);

b) image detection means for capturing images of an interaction region between said laser light beam and powder injected onto said substrate surface (Col. 5, line 54 – Col. 6, line 11); and

c) a computer control means connected to said laser, said positioning means and said powder injection means, and said computer control means including image processing means for the processing images of the interaction region between said laser light beam and powder injected onto said substrate surface and extracting from said images pre-selected properties of the growing clad in real-time (Col. 6, lines 1-21), said computer control means including processing means to compare said pre-selected properties of the growing clad in real-time to desired values of said pre-selected properties of the growing clad produced by an effective model of cladding growth by laser processing of powder (Col. 10, lines 41-46), said computer control means responsively adjusting parameters of the laser light beam (Col. 5, lines 1-19), powder feedrate (Col. 4, line 1; Col. 10, lines 32-34) and positioning means (Col. 5, lines 1-19) based on differences between the extracted values of the pre-selected properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad (Col. 10, lines 41-46; Col. 11, lines 4-15).

2. The system according to claim 1 wherein said computer control means includes modeling means to model an object (Col. 10, lines 41-46), and extract from said model the desired values for the pre-selected properties of the growing clad in real-time, and wherein said image processing means includes pattern recognition processing means to extract the pre-selected properties of the growing clad in real-time from images captured by the image detection means (Col. 8, lines 54-65), said computer control means including intelligent process controller means interfaced to said laser, said substrate positioning means and said powder injection means for adjusting the laser parameters, substrate holder velocity, powder feedrate and orientation of powder stream directed onto the surface of the substrate, and wherein said modeling means and

said image processing means are each connected to said intelligent process controller means which adjusts the parameters of the laser light beam, substrate holder velocity, powder feedrate and orientation of powder stream directed onto the surface of the substrate based on the differences between the extracted values of the pre-selected properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad (Col. 10, lines 41-46).

5. The system according to claim 1 wherein said laser parameters include beam size of the laser light beam focused onto the substrate surface and energy of the laser light beam (Col. 3, line 65 – Col. 4, line 4).

6. The system according to claim 5 wherein said laser is a pulsed laser and wherein said laser parameters include pulse rate of the laser and pulse duration of each laser light pulse produced by the laser (Col. 7, lines 55-65).

9. The system according to claim 2 wherein said positioning means is connected to said substrate holder for moving said substrate holder with respect to said laser beam (Col. 4, lines 8-16; Fig. 1, element 114).

10. The system according to claim 9 wherein said positioning means includes speed adjustment means for adjusting a speed of the substrate holder with respect to the laser light beam (Col. 11, claim 11).

11. The system according to claim 9 wherein said focusing means for directing and focusing a laser light beam includes adjustable focusing optics for adjusting a beam size of the laser light beam on the surface of the substrate (Col. 6, lines 1-45).

12. The system according to claim 1 wherein said laser is a continuous wave (CW) or pulsed laser beam (Col. 7, lines 55-65).

30. The method according to claim 15 wherein the pre-selected properties of the clad include height, width, rate of solidification and clad roughness (Col. 8, lines 18 – Col. 9, lines 9).

10. Claims 1, 5, 12-15 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Pat. No. 6,459,951 to Griffith (supplied by applicant).

Referring to claims 1 and 15, Griffith teaches a system for producing a cladding on a substrate, comprising:

a) a laser for processing materials and focusing means for directing and focusing a laser light beam from said laser onto a substrate surface (Col. 3, line 64 – Col. 4, line 3), a substrate holder and positioning means for adjusting the position of the laser light beam and the substrate with respect to each other (Col. 4, lines 41-65), and powder injection means for injecting powder onto said substrate (Col. 4, lines 3-9);

b) image detection means for capturing images of an interaction region between said laser light beam and powder injected onto said substrate surface (Col. 7, lines 3-27; Col. 8, lines 1-17; Fig. 3); and

c) a computer control means connected to said laser, said positioning means and said powder injection means, and said computer control means including image processing means for the processing images of the interaction region between said laser light beam and powder injected onto said substrate surface and extracting from said images pre-selected properties of the growing clad in real-time, said computer control means including processing means to compare

said pre-selected properties of the growing clad in real-time to desired values of said pre-selected properties of the growing clad produced by an effective model of cladding growth by laser processing of powder (Fig4, last element), said computer control means responsively adjusting parameters of the laser light beam (Col. 12, claim 4), powder feedrate (Col. 12, claim 6) and positioning means (Col. 12, claim 5; Col. 4, lines 41-49) based on differences between the extracted values of the pre-selected properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad (Fig. 4-5; Col. 9, lines 25 – Col. 10, lines 9; Col. 11, lines 1-19).

5. The system according to claim 1 wherein said laser parameters include beam size of the laser light beam focused onto the substrate surface and energy of the laser light beam (Col. 3, line 67 – Col. 4, line 2).

12. The system according to claim 1 wherein said laser is a continuous wave (CW) or pulsed laser beam (Col. 1, lines 55-58).

13. The system according to claim 1 wherein said image detection means is at least two charge coupled device (CCD) cameras positioned in a pre-selected orientation with respect to each other and the substrate surface (Col. 11, lines 34-47).

14. The system according to claim 1 wherein said image detection means is a plurality of charge coupled device (CCD) cameras disposed about said substrate for capturing a plurality of images (Col. 11, lines 34-47).

11. Claims 32, 34, 36 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 5,961,861 to McCay.

Referring to claim 32, McCay teaches a method of producing an iron-aluminum clad on a surface of a substrate by laser processing (Fig. 1; Col. 1, lines 18-50), comprising the steps of: directing a stream of pre-mixed Fe and Al powders onto a surface of a substrate (Col. 2, lines 31-49; Col. 3, lines 28-35, treated metal includes substrate metal and alloying metal), pre-mixed to a specified bulk composition (alloy), and directing a laser beam onto the surface of the substrate which is simultaneously melted by the laser beam along with the powder such that melted powder mixes with the molten substrate surface (Col. 2, lines 54-67; Col. 3, lines 1-16; Col. 3, lines 36-38); and cooling the heated area of the substrate where upon cooling, the molten substrate surface and molten powder solidify and a fusion bond is formed between the clad material and substrate (Col. 3, lines 38-47; Col. 3, line 65 – Col. 4, line 2).

34. The method according to claim 32 wherein the substrate is mild steel (Col. 3, lines 31-35).

36. The method according to claim 32 wherein the laser beam is a pulsed laser beam (Col. 8, lines 13-18).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 2 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 6,459,951 to Griffith as applied to claims 1, 5, 12-15 above, and further in view of U.S. Pat. No. 6,046,426 to Jeantette (supplied by applicant).

Referring to claim 9, Griffith teaches the system above wherein said positioning means is connected to said substrate holder for moving said substrate holder with respect to said laser beam (Col. 4, lines 41-49).

Referring to claim 10, Griffith teaches the system according to claim 9 wherein said positioning means includes speed adjustment means for adjusting a speed of the substrate holder with respect to the laser light beam (Col. 12, lines 44-48).

Referring to claim 11, Griffith teaches the system according to claim 9 wherein said focusing means for directing and focusing a laser light beam includes adjustable focusing optics for adjusting a beam size of the laser light beam on the surface of the substrate (Col. 3, line 67 – Col. 4, line 2).

Referring to claim 2, Griffith teaches all the limitations set forth above, and further teaches that effects can be modeled to sufficient accuracy that an ideal apparatus performing ideal operations on ideal source material will successfully reproduce the desired component (Col. 5, lines 32-38). However, Griffith fails to teach said computer control means includes modeling

means to model an object, and extract from said model the desired values for the pre-selected properties of the growing clad in real-time, and wherein said image processing means includes pattern recognition processing means to extract the pre-selected properties of the growing clad in real-time from images captured by the image detection means, said computer control means including intelligent process controller means interfaced to said laser, said substrate positioning means and said powder injection means for adjusting the laser parameters, substrate holder velocity, powder feedrate and orientation of powder stream directed onto the surface of the substrate, and wherein said modeling means and said image processing means are each connected to said intelligent process controller means which adjusts the parameters of the laser light beam, substrate holder velocity, powder feedrate and orientation of powder stream directed onto the surface of the substrate based on the differences between the extracted values of the pre-selected properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad.

However, referring to claim 2, Jeantette teaches analogous art, wherein computer control means includes modeling means to model an object, and extract from said model the desired values for the pre-selected properties of the growing clad in real-time, and wherein said image processing means includes pattern recognition processing means to extract the pre-selected properties of the growing clad in real-time from images captured by the image detection means, said computer control means including intelligent process controller means interfaced to said laser, said substrate positioning means and said powder injection means for adjusting the laser parameters, substrate holder velocity, powder feedrate and orientation of powder stream directed onto the surface of the substrate, and wherein said modeling means and said image processing

means are each connected to said intelligent process controller means which adjusts the parameters of the laser light beam, substrate holder velocity, powder feedrate and orientation of powder stream directed onto the surface of the substrate based on the differences between the extracted values of the pre-selected properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad (Fig. 9; Col. 9, line 15 – Col. 11, line 47).

Therefore it would have been obvious to one of ordinary skill in the art at the time that the invention was made to combine the teachings of Jeantette with the teachings of Griffith.

One of ordinary skill in the art would have been motivated to combine these references because Jeantette teaches a system for the production of objects of varying three-dimensional complexity in a layerwise manner and using sensor feedback to effectively regulate the process (Col. 2, lines 11-56).

13. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 6,459,951 to Griffith as applied to claims 1, 5, 12-15 above, and further in view of U.S. Pat. No. 5,619,589 to Otsu.

Referring to claims 16-17, Griffith teaches all of the limitations set forth above, and further teaches a sensor providing a gray-scale image (Col. 7, lines 3-8) and capturing the images with at least two image detectors (Col. 11, lines 34-47). However, Griffith fails to teach the step of processing the captured images includes producing a binary black and white image in which black indicates one of the melting and solid areas of the clad and substrate respectively and the white areas indicates the other, wherein the step of processing the captured images includes

projection of the images received from the at least two image detectors onto a reference plane using a transformation matrix that is obtained based on orientations of the at least two image detectors with respect to the reference plane.

However, Otsu teaches analogous art, wherein the step of processing captured images includes producing a binary black and white image in which black indicates one of either counts or measurements of geometric characteristics of objects respectively and the white areas indicates the other (Col. 1, lines 20-26), wherein the step of processing the captured images includes projection of the images received from the image detectors onto a reference plane using a transformation matrix that is obtained based on orientations of the detectors with respect to the reference plane (Col. 5, lines 6-27; Col. 10, lines 17-39).

Therefore it would have been obvious to one of ordinary skill in the art at the time that the invention was made to combine the teachings of Otsu with the teachings of Griffith.

One of ordinary skill in the art would have been motivated to combine these references because Otsu teaches an adaptive learning type general purpose image measurement and recognition method and apparatus which extracts features in two stages of a relatively simple structure based on the observation of basic and principle conditions of the image measurement, and adaptively measures the images for arbitrary objects or usages suitable for various environments by a high speed learning operation (Col. 2, lines 53-61).

14. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,961,861 to McCay as applied to claims 32, 34, and 36 above, and further in view of U.S. Pat. No. 6,459,951 to Griffith ***or*** U.S. Pat. No. 6,122,564 to Koch.

Referring to claim 33, McCay teaches the method according to claim 32 including capturing images of an interaction region between the laser light beam and the pre-mixed Fe and Al powders powder injected onto the substrate surface (Col. 13, lines 7-15 of '861); and processing the captured images of the interaction region between said laser light beam and pre-mixed Fe and Al powders powder injected onto the substrate surface and extracting from the images pre-selected properties of the Fe--Al clad in real-time (Col. 13, lines 7-15; Col. 12, lines 31-41 of '861), and calculating a difference (Col. 16, lines 15-40, feedback control of '861) between the extracted pre-selected properties to desired values of the selected properties, and using the difference to adjust laser processing parameters to substantially give the preferred real time values of said selected properties of the Fe--Al clad (Col. 13, lines 7-15; Col. 16, lines 15-40 of '861).

Referring to claim 33, McCay teaches all of the limitations set forth above however fails to teach that the desired values of the selected properties are produced by an effective model cladding growth by laser processing of powder.

However, referring to claim 33, Griffith teaches analogous art, wherein a method of producing a clad on a surface of a substrate by laser processing, comprises the steps of: directing a stream of powders onto a surface of a substrate, and directing a laser beam onto the surface of the substrate which is simultaneously melted by the laser beam along with the powder such that melted powder mixes with the molten substrate surface (Col. 4, lines 1-29 of '951); and cooling the heated area of the substrate (Col. 4, lines 18-39 of '951), further comprising:

a) a laser for processing materials and focusing means for directing and focusing a laser light beam from said laser onto a substrate surface (Col. 3, line 64 – Col. 4, line 3 of '951), a substrate holder and positioning means for adjusting the position of the laser light beam and the substrate with respect to each other (Col. 4, lines 41-65 of '951), and powder injection means for injecting powder onto said substrate (Col. 4, lines 3-9 of '951);

b) image detection means for capturing images of an interaction region between said laser light beam and powder injected onto said substrate surface (Col. 7, lines 3-27; Col. 8, lines 1-17; Fig. 3 of '951); and

c) a computer control means connected to said laser, said positioning means and said powder injection means, and said computer control means including image processing means for the processing images of the interaction region between said laser light beam and powder injected onto said substrate surface and extracting from said images pre-selected properties of the growing clad in real-time, said computer control means including processing means to compare said pre-selected properties of the growing clad in real-time to desired values of said pre-selected properties of the growing clad produced by an effective model of cladding growth by laser processing of powder (Fig 4, last element of '951), said computer control means responsively adjusting parameters of the laser light beam (Col. 12, claim 4 of '951), powder feedrate (Col. 12, claim 6 of '951) and positioning means (Col. 12, claim 5; Col. 4, lines 41-49 of '951) based on differences between the extracted values of the pre-selected properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad (Fig. 4-5; Col. 9, lines 25 – Col. 10, lines 9; Col. 11, lines 1-19 of '951).

However, referring to claim 33, Koch teaches analogous art, wherein a system of producing a clad on a surface of a substrate by laser processing, comprises:

a) a laser for processing materials and focusing means for directing and focusing a laser light beam from said laser onto a substrate surface (Fig. 1, elements 110 and 112 of '564), a substrate holder and positioning means for adjusting the position of the laser light beam and the substrate with respect to each other (Col. 4, lines 8-16; Fig. 1, element 114 of '564), and powder injection means for injecting powder onto said substrate (Figs. 2 and 3, element 202; Col. 4, lines 23-47 of '564);

b) image detection means for capturing images of an interaction region between said laser light beam and powder injected onto said substrate surface (Col. 5, line 54 – Col. 6, line 11 of '564); and

c) a computer control means connected to said laser, said positioning means and said powder injection means, and said computer control means including image processing means for the processing images of the interaction region between said laser light beam and powder injected onto said substrate surface and extracting from said images pre-selected properties of the growing clad in real-time (Col. 6, lines 1-21 of '564), said computer control means including processing means to compare said pre-selected properties of the growing clad in real-time to desired values of said pre-selected properties of the growing clad produced by an effective model of cladding growth by laser processing of powder (Col. 10, lines 41-46 of '564), said computer control means responsively adjusting parameters of the laser light beam (Col. 5, lines 1-19 of '564), powder feedrate (Col. 4, line 1; Col. 10, lines 32-34 of '564) and positioning means (Col. 5, lines 1-19 of '564) based on differences between the extracted values of the pre-selected

properties of the growing clad in real-time and the desired values of the pre-selected properties of the growing clad (Col. 10, lines 41-46; Col. 11, lines 4-15 of '564).

Therefore, it would have been obvious to one of ordinary skill in the art at the time that the invention was made to combine the teachings of either Griffith or Koch with the teachings of McCay.

One of ordinary skill in the art would have been motivated to combine Griffith with McCay because Griffith teaches feedback control of direct laser fabrication wherein the feedback refers to actual growth conditions obtained by real-time analysis of thermal radiation images (Abstract of '951), wherein this type of fabrication system produces components with superior dimensional tolerances and surface quality (Col. 3, lines 27-37 of '951).

One of ordinary skill in the art would have been motivated to combine Koch with McCay because Koch teaches automatically controlling the build-up of material on a substrate with a CAD system including a description of an article to be fabricated such that a feedback controller can compare the physical dimension of the deposit to the description and adjust the energy of the laser in accordance therewith (Col. 2, lines 10-16 of '564). Further advantages of having the CAD system is the ability to fabricate a complete part with desired properties within a short period of time (Col. 3, lines 56-60 of '564).

15. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,961,861 to McCay as applied to claims 32, 34, and 36 above, and further in view of U.S. Pat. No. 6,869,508 to Darolia.

Referring to claim 35, McCay fails to teach that the specified bulk composition is about Fe:20 wt % Al.

However, Darolia teaches analogous art, directed to coatings for pulsed laser deposition wherein a specified bulk composition for the coating is about Fe:20 wt % Al (Col. 1, lines 47-52; Col. 4, lines 13-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time that the invention was made to combine the teachings Darolia with the teachings of McCay.

One of ordinary skill in the art would have been motivated to combine Darolia with McCay because Darolia teaches PVD processes including pulsed laser deposition (Col. 1, lines 47-52), wherein the process produced coatings with controlled chemistries and higher deposition rates (Col. 3, lines 13-22).

Allowable Subject Matter

16. Claims 3, 4, 7, 8, 18-29, and 31 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sean P. Shechtman whose telephone number is (571) 272-3754. The examiner can normally be reached on 9:30am-6:00pm, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo P. Picard can be reached on (571) 272-3749. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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SPS

Sean P. Shechtman

April 16, 2005

LEO PICARD
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100